Commodore

The Transactor

comments and bulletins
concerning your
COMMODORE PET

BULLETIN # 6
October 31, 1978

The October edition of the news bulletin begins with some very exciting news....

The complete PET business system will be unveiled at the 1978 Canadian Computer Show. On display will be the PET with a new "typewriter style" keyboard, a floppy disk, and a printer.

The Computer Show will be held in Toronto at the International Centre, 6900 Airport Road. The times and dates are:

November 28	12:00 to 6:00 P.M.
November 29	12:00 to 9:00 P.M.
November 30	12:00 to 6:00 P.M.

Snowless Version of Life:

The "Life" program listed in Transactor #5 can be further refined to eliminate the snowy effect on the screen. Mark Taylor, in the U.K., has written to us with a snowless version of Life. He also included another interesting program illustrated in example 2:

1. If you are plagued by snow on the screen during POKE operations to the screen RAM or with machine code programmes, then if in BASIC location 59409 is POKEd with 52 then that will inhibit the character generator. Any transfer operations can then be carried out with the screen totally blank. To restore normal operation the above location should be POKEd with 60. For machine code programmes then LDA 52 & STA ABSOLUTE the above location will be somewhat faster.

The attached listing is a snowless version of "Life".

```
100 READL
110 READA$:C=LEN(A$):IFA$="*"THENEND
120 IFC<10RC>2THEN200
130 A=ASC(A$)-48:B=ASC(RIGHT$(A$,1))-48
140 N=B+7*(B>9)-(C=2)*(16*(A+7*(A>9)))
150 IFN<0ORN>255THEN200
160 POKEL,N:L=L+1:GOTO110
200 PRINT"BYTE"L"=<"A$"> ???":END
300 DATA6400
310 DATA20,30,19,20,8A,19,20,E6,19,20,00,1A,A9,34,8D,11,E8
320 DATA20,70,19,A9,3C,8D,11,E8,A9,FF,CD,12,E8,F0,E6,4C,8B,C3,AA,68,28,4C,8B,C3
330 DATA EA,EA,EA,EA,EA,EA,EA,A2,19,BD,3A,19,95,1F,CA,D0,F8,60,00,80,00,15,00
340 DATA80,00,1B,00,1B,D7,26,01,FE,D8,D6,29,27,00,E8,83,00,15,00,00
350 DATAEA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA,EA
360 DATAEA,EA,EA,EA,EA,20,A6,19,B1,26,D0,06,A9,20,91,20,D0,04,A9,51,91,20,20
370 DATA BD,19,F0,ED,20,A6,19,60,20,A6,19,B1,20,C9,51,F0,06,A9,00,91,26,F0
380 DATA04,A9,01,91,26,20,BD,19,F0,EB,20,A6,19,60,A9,00,AA,A8,85,20,85,26,85
390 DATA39,A5,25,85,21,A5,29,85,27,A5,36,85,3A,60,E6,26,E6,20,E6,39,E8,E4
400 DATA33,F0,0C,E0,00,D0,0E,E6,27,E6,21,E6,3A,D0,06,A5,34,C5,21,F0,03,A9,00
410 DATA 60,A9,01,60,EA,EA,EA,EA,EA,EA,20,A6,19,B1,26,D0,06,A9,20,91,39,D0
420 DATA04,A9,51,91,39,20,BD,19,F0,ED,20,A6,19,60,20,A6,19,20,2F,1A,B1,39,C9
430 DATA51,F0,0C,A5,32,C9,03,D0,14,A9,01,91,26,D0,0E,A5,32,C9,03,F0,08,C9,02
440 DATAF0,04,A9,00,91,26,20,BD,19,F0,D8,20,A6,19,60,98,48,8A,48,A0,00,84,32
450 DATAA2,08,B5,29,10,15,49,FF,85,37,38,A5,39,E5,37,85,22,A5,3A,85,23,B0,11
460 DATAC6,23,D0,0D,18,65,39,85,22,A5,3A,85,23,90,02,E6,23,B1,22,C9,51,D0,02
470 DATAE6,32,CA,D0,CF,68,AA,68,A8,60,*
```

2. To input data in BASIC without returning to BASIC command mode on receipt of a null string then an input statement can be simulated by a GET loop which contains additional statements to cope with DEL codes. This has the additional advantage that if there is a displayed frame on screen the frame characters will not be accepted as part of the input.

The attached listing shows the above routine. This starts at line 9000 and to use it, instead of INPUT A$ you put GOSUB 9000:A$=IN$.

```
8000 REM SUBROUTINE TO SIMULATE NON-PET      STANDARD INPUT STATEMENT
8010 REM STANDARD INPUT DOES NOT BREAK      ON RECEIPT OF A NULL STRING
8020 REM "TINPUT" COULD BE ALSO BE          SIMULATED EASILY
8030 REM ZA$ IS DEFINED IN LINE 10
9000 IN$="":PRINT" ? ";
9010 GOSUB9070:PRINTZA$(ZB);:IFZ$=""THEN9010
9020 IFZ$=CHR$(13)THENPRINT" ":RETURN
9030 IFZ$=CHR$(20)THENONSGN(LEN(IN$))+1GOTO9010,9060
9040 PRINTZ$;:IN$=IN$+Z$:GOTO9010
9060 PRINTZ$;:IN$=MID$(IN$,1,LEN(IN$)-1):GOTO9010
9070 ZB=1+(ZB=1):FORZA=1TO60:GETZ$:IFZ$<>""THENRETURN
9080 NEXT:RETURN
```

Programme Overlays on a PET - Supplied by Mike Stone

1. The 8K core of a PET is not usually a limitation in the home computer and hobbyist world, nor even in an educational environment where students are just creating small exercise programs. With the devices now available for attachement - the second cassette,(the printer, and floppy discs shortly) - the PET becomes a valid and genuine data processing machine, and complex string handling programs with files may well run out of space.

2. Programmers with experience on other computers know that one answer to this kind of problem is to break the program down into segments, so that only part of it is occupying memory at any time, and all or part is "overlaid" by other segments as required. When the program segments are on a disc, direct access features normally permit great flexibility, in that any required segment can be loaded; for tape only systems, the segments have to be arranged in order of need - e.g. job initialisation, main coding, and termination segments.

3. Since PET's BASIC includes a LOAD instruction to acquire dynamically a new program from tape, and (provided the new program is no longer than the one issuing the LOAD) all data areas remain available to the loaded program, the basis exists for an overlay system. However, for true overlaying, it is essential that some of the original program (e.g. control of the program flow, common subroutines, etc.) be retained throughout, whatever new segments are loaded. PET does not do this automatically; this paper tells you how to do it.

4. PET stores BASIC programs in location 1024 upwards. Note that the pointers, and line numbets, are pairs of bytes giving low/high. The high must be multiplied by 256 and added to the low to give the actual quantity.

5. Whenever a line of code is entered from the keyboard, PET moves every statement around as necessary and re-adjusts all the chaining, so that statements are always stored in strict sequence of line number.

6. When your program contains a LOAD statement, this does NOT imply either CLR or NEW. The new program is simply loaded in at (and then executed from) location 1024, for as much space as it needs. The new program does NOT (as with some BASIC's) just replace those statements with identical line numbers; it is strictly a new program in its own right. However, any program statements at the end of the LOADING program whose space is not required by the LOADED program do remain unscathed by the LOAD. The problem is that the new program has no (forward-) chain into them, so PET knows nothing about them.

7. **It follows from the above that if we code the instructions-to-be-preserved with high line numbers; and if the space needed by the newly-loaded segment does not over-write them; and if we can force the new segment to chain into the old instructions; then we have a real overlay system. So, if during the original program you can find in memory the last statement not to be preserved, you know it forward chains into the next highest line number, i.e. the first of the statements you do want preserved. Then when the overlay arrives, you need only find its very last statement and replace its forward-chain by the one you previously found, and both new and old code form a contiguous program.**

8. A very simple illustration follows

Enter this program (do NOT put any spaces, except after line numbers):

```
1Ø   A=A+1
2Ø   GOSUB5Ø
3Ø   LOAD"NEWPROG"
5Ø   PRINTA*2
55   RETURN
```

This is stored as follows ("PEEK" values):

```
1024)    0
   5)   11     } forward chain; 4 x 256 = 1024 + 11 = 1035
   6)    4     }
   7)   10     }
   8)    0     } line number 10
   9)   65           A
1030)  178           =
   1)   65           A
   2)  170           +
   3)   49           1
```

```
   4)     0
 → 5)    19      } forward chain; 4 x 256 = 1024 + 19 = 1043
   6)     4      }
   7)    20          } line number 20
   8)     0          }
   9)   141              GOSUB
1040)    53              5
   1)    48              0
   2)     0
 → 3)    34      } forward chain; 4 x 256 = 1024 + 34 = 1058
   4)     4      }
   5)    30          } line number 30
   6)     0          }
   7)   147              LOAD
   8)    34               "
   9)    78              N
1050)    69              E
   1)    87              W
   2)    80              P
   3)    82              R
   4)    79              O
   5)    71              G
   6)    34              "
   7)     0
 → 8)    43      } forward chain; 4 x 256 = 1024 + 43 = 1067
   9)     4      }
1060)    50          } line number 50
   1)     0          }
   2)   153              PRINT
   3)    65              A
   4)   172              *
   5)    50              2
   6)     0
   7)    49      } forward chain; 4 x 256 = 1024 + 49 = 1073
   8)     4      }
   9)    55          } line number 55
1070)     0          }
   1)   142              RETURN
   2)     0
 → 3)     0
```

If we want lines 50 and 55 to be available to an overlay, the important information is the forward chain in line 30, i.e. locations 1043 and 1044.

9. To see how it works, SAVE"PROG" and leave the cassette Record and Play keys down.

Enter NEW; then the following (again, no spaces):

```
 5   A=A*2
1Ø   GOSUB5Ø
15   STOP
```

LIST if you like, to confirm that there are no lines 50 and 55.
SAVE"NEWPROG".

Now rewind your tape, and press RUN.
PROG will be loaded, will print "2", and continue up the tape. When NEWPROG has been loaded, you will get

```
?UNDEF'D STATEMENT ERROR IN 1Ø
```

That is because the overlay looks like this:

```
1024)    0
   5)   11      } forward chain to 1035
   6)    4      }
   7)    5          } line number 5
   8)    0          }
   9)   65              A
1030)  178              =
   1)   65              A
   2)  172              *
   3)   50              2
   4)    0
 → 5)   19      } forward chain to 1043
   6)    4      }
   7)   10          } line number 10
   8)    0          }
   9)  141              GOSUB
1040)   53              5
```

```
   1)   48                 0
   2)    0
 → 3)   25      } forward chain to 1049
   4)    4      }
   5)   15            } line number 15
   6)    0            }
   7)  144                 STOP
   8)    0
 → 9)    0
```

10. The last line, 15, does not chain into the old line 50. But that line 50 is still there, in location 1058 et seq. So, do this:

```
POKE 1043,34
POKE 1044, 4
```

LIST - and behold, NEWPROG now includes lines 50 and 55!

You can RUN if you like, to prove it.

What we have done is to use what we discovered about the first program (last sentence of paragraph 9) to modify the second program.

11. How do you program all this to happen automatically? It is not at all difficult. Let us assume that the statements-to-be-preserved are at lines 5000 and upwards. So, just before that, code this <u>(NO SPACES)</u>:

```
4997   N1=PEEK(201)   Get (low) address of line 4998
4998   N2=PEEK(202)   Get (high) address of line 4999
4999   RETURN
5000   ....  ....
```

(Locations 201, 202 always contain, during instruction execution, the address of the next instruction - strictly, the "Ø" between instructions.)

12. Now, just before your program wants to load in the overlay program, code this (spaces if you like!):

```
850  GOSUB 4997
860  N1 = N1 + 14              Low address of 4999 (the length
                               of 4998 is 14 bytes)
870  N2 = N2 * 256             Actual high address of 4999
880  If N1 < 256 THEN 900      Adjust low for page boundary
890  N1 = N1 - 256
900  BC = N1 + N2 + 1          BC is now actual machine address
                                    of line 4999
910  Z1 = PEEK(BC):Z2=PEEK(BC+1)   Hold the forward-chain
                                    locations out of 4999
920  LOAD "NEWPROG"
```

13. As the first instructions of NEWPROG, the chain-adjusting must be done. The necessary code is very similar:

At the <u>end</u> of NEWPROG, as the very last statements, code (<u>NO</u> spaces):

```
3997      N1=PEEK(201)
3998      N2=PEEK(202)
3999      RETURN
```

And at the beginning code:

```
10        GOSUB3997
20        N1=N1+14
30        N2=N2*256
40        IF N1<256 THEN 60
50        N1=N1-256
60        BC=N1+N2+1      BC is now actual machine
                          address of 3999
70        POKE BC,Z1:POKE BC+1,Z2
```

14. It is worth just reiterating that the <u>total size</u> of the incoming overlay (irrespective of line numbers; just its size in bytes occupied) must be less than the total size of the instructions being overlaid.

Mike Stone

ABBREVIATING BASIC WORDS

As explained in the instruction manual, any BASIC word takes up 1 byte of memory storage space. It has been stated that the work "PRINT" can be abbreviated to "?" which saves time on entering programs. When listed, the word is expanded to its full form. Both forms take 1 byte per word.

We now have information on how to abbreviate the complete list of BASIC words. The algorithm to remember is as follows:

1. For any BASIC word, type in the first letter of the word (e.g. V for VERIFY).

2. Hold down the 'Shift' key and type in the second letter. If you are in graphics mode, this will appear as a graphic character (e.g. for E). It is a good idea to go into lower case mode as the two letters are then easy to read.(Poke 59468, 14 → 12 for PET to graphics).

In some cases, this two-letter method gives a possibility of more than one BASIC word (e.g. READ and RESTORE). For one of the words (usually the longer) it will be necessary to type the first two letters and the shifted third. All these abbreviations are converted to full words upon the command LIST.

Below is a complete list of the words and abbreviations:

BASIC	ABBREV	BASIC	ABBREV	BASIC	ABBREV
LET	Le	DEF	De	RUN	Ru
READ	Re	RETURN	REt	CLR	Cl
PRINT	?	STOP	St	LIST	Li
PRINT#	Pr	STEP	STe	CONT	Co
DATA	Da	INPUT#	In	FRE	Fr
THEN	Th	SGN	Sg	TAB(	Ta
FOR	Fo	ABS	Ab	SPC(	Sp
NEXT	Ne	SQR	Sq	PEEK	Pe
DIM	Di	RND	Rn	POKE	Po
END	En	SIN	Si	USR	Us
GOTO	Go	ATN	At	SYS	Sy
RESTORE	REs	EXP	Ex	WAIT	Wa
GET	Ge	AND	An	LEFT$	LEf
GOSUB	GOs	NOT	No	RIGHT$	Ri
OPEN	Op	VAL	Va	MID$	Mi
CLOSE	CLo	ASC	As	CHR$	Ch
SAVE	Sa	CMD	Cm	STR$	STr
LOAD	Lo	VERIFY	Ve		

SIMULATING A CALCULATOR ON YOUR PET

Many users have asked whether the PET can do live calculations. Although a simple sum such as 2 + 3 can be performed thus:

```
PRINT 2 + 3 'RETURN'
```

it would be more convenient if the operation of a calculator could be simulated directly. The following program should give you an idea of how this can be achieved:

```
5 REM    GRAPHICS
10 PRINT"♥           ┌──────────────────────┐"
20 PRINT"           │                      │"
25 PRINT"           │                      │"
30 PRINT"           └──────────────────────┘"
40 FORI=1TO19
50 PRINT"           ■                      "
60 NEXT
1000 REM  CONTROLLER / INPUT
1010 GETA$:IFA$=""GOTO1010
1020 A=ASC(A$)
1030 IFA>57THEN4000
1040 IFA<48ANDA<>46THEN2000
1050 IF T=1 THENX$="":T=0
1055 IFLEN(X$)=9THEND$="ERROR       ":GOSUB5115:T=1:GOTO1000
1060 X$=X$+A$:X=VAL(X$):GOSUB5020
1070 GOTO1000
2000 REM OPERATORS
2010 IFA<40ORA=44THEND$="ERROR           ":GOSUB5115:CLR:GOTO1000
2020 IFA=40THENN=N+1:B(N)=X:X=0:Y=0:O$(N)=O$:O$="":T=1:GOSUB5000 :GOTO1000
2030 IFO$="*"THENX=X*Y
2040 IFO$="/"THENX=Y/X
2050 IFO$="+"THENX=X+Y
2060 IFO$="-"THENX=Y-X
2065 Y=X:O$=A$:T=1
2070 IFA=41THENY=B(N):O$=O$(N):N=N-1:T=0
2080 GOSUB5000:GOTO1000
4000 IFA$="S"THENX=SIN(X)
4010 IFA$="C"THENX=COS(X)
4020 IFA$="T"THENX=TAN(X)
4030 IFA$="L"THENX=LOG(X)
4040 IFA$="E"THENX=EXP(X)
4042 IFA$="="GOTO2030
4043 IFA$="←"THENCLR:T=1
4045 GOSUB5000
4050 GOTO1000
5000 REM DISPLAY
5010 X$=STR$(X)
5020 D$=RIGHT$("              "+X$,11)+"     "
5030 IFX<=999999999ANDX>.01GOTO5115
5040 IFX=0GOTO5115
5050 IFABS(X)>1E38ORABS(X)<1E-38THEND$="ERROR           ":GOTO5115
5100 R$=RIGHT$("              "+X$,15)
5110 D$=LEFT$(R$,11)+" "+RIGHT$(R$,3)
5115 PRINT"■■■■■■■■■■■■■■■"D$
5120 RETURN
READY.
```

{"home" 2x "CURSOR DOWN" 12x "CURSOR RIGHT"

Although the program is by no means perfected, the framework exists for a versatile program. Lines 4000 onwards determine the functions so that when 'S' is pressed the sine of the number on display is calculated and to clear all registers '←' is pressed. The normal operation for +, -, x and ÷ is the same as a straightforward calculator, and there are multiple sets of brackets.

This idea could be used to simulate actual models - including programmable calculators, thus giving access to a wide range of ready-written low key software. We would like to hear from any user who succeeds in doing this.

BITS AND PIECES

Some more hints and tips to help you write efficient programs:

When writing REMark statements, graphics and lower case can be included if they are put inside inverted comma's. This enables separating lines such as:

```
1Ø   REM "————————————————"

*    *    *    *    *    *    *    *    *    *    *    *
```

When using subscripted variables such as A(4) the operating system automatically reserves 10 elements without having to declare a dimension with DIM. If, however, you are using a very long program and are using less than 10 elements per variable - say 4 - it will save space to declare the dimension's length. For example:

```
1Ø   DIM A(4), C$(3)

*    *    *    *    *    *    *    *    *    *    *    *
```

To display a number (N) to D decimal places, use the following routine:

```
1Ø   M = INT(N*1Ø↑D+Ø.5)/1Ø↑D

2Ø   PRINT M
```

* * * * * * * * * * * *

For an intriguing display of graphics, try running this one line program entitled "BURROW"

```
1 A$="↑↓→←":PRINTMID$(A$,RND(.5)*4+1,1)"*←";:FORT=1TO3Ø:
NEXT:PRINT"R Ø←";:GOTO1
```

* * * * * * * * * * * *

NEW PET MANUAL:

We are currently working on an extensive PET users manual. The manual will eventually be available for sale through our dealers. We do plan, however, offering the manual in chapters through future issues of the "Transactor".